The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for determining the thermal expansion coefficient of a substance comprising:

determining at each of two or more temperatures the absolute position in wavelength or frequency represented by multiple resonant interference peaks of a Fabry-Perot etalon whose optical path is defined by said substance and calculating a value of said coefficient from ~~observed~~ calculated difference(s) in said wavelengths or frequencies at said two or more temperatures, said difference(s) being calculated statistically from said multiple resonant interference peaks.

2. (Original) A method of claim 1, where frequency positions are measured.

3. (Original) A method of claim 1, wherein wavelength positions are measured.

4. (Original) A method of claim 1, wherein said Fabry-Perot etalon consists essentially of a solid sample of said substance having highly flat end surfaces.

5. (Original) A method of claim 1, wherein said Fabry-Perot etalon comprises an optical path consisting essentially of said substance and at the ends thereof highly flat plates of a different material.

6. (Currently Amended) A method of claim 1, wherein the change in length (ΔL) of said substance at two different temperatures is calculated from ~~the measured~~ differences ($\Delta\nu$) in the absolute position in frequency represented by multiple resonant interference peaks by the equation:

$$\Delta\nu = \frac{-\nu}{L}\Delta L, \qquad (4)$$

where L is the Fabry-Perot gap at the first temperature and ν is the frequency position of the

respective peak at said temperature.

7. (Original) A method of claim 1, wherein the frequency peak positions are in the range of 1300 - 1700 nm.

8. (Original) A method of claim 1, wherein the end surfaces of the etalon has $\lambda/20$ flatness or better and <0.5 arc second parallelism or better.

9. (Original) A method of claim 1, wherein the number of said peak positions measured is ten or more.

10. (Original) A method of claim 1, wherein the finesse of the etalon is 1 - 1000.

11. (Currently Amended) A method for determining the thermal expansion coefficient of a substance comprising:

determining at each of two or more temperatures the absolute position in wavelength or frequency represented by multiple resonant interference peaks of a Fabry-Perot etalon whose optical path is defined by said substance and calculating a value of said coefficient from ~~observed~~ calculated difference(s) in said wavelengths or frequencies at said two or more temperatures, wherein said absolute positions are determined by simultaneous reference to a standard having multiple fiducial marks which are overlaid onto etalon based resonances, said difference(s) being calculated statistically from said multiple resonant interference peaks.

12. (Currently Amended) A method for determining the thermal expansion coefficient of a substance comprising:

determining at each of two or more temperatures the absolute position in wavelength or frequency represented by ten or more resonant interference peaks of a Fabry-Perot etalon whose optical path is defined by said substance and calculating a value of said coefficient from ~~observed~~ calculated difference(s) in said wavelengths or frequencies at said two or more temperatures, wherein

said absolute positions are determined by simultaneous reference to a standard having multiple fiducial marks which are overlaid onto etalon based resonances, said difference(s) being calculated statistically from said multiple resonant interference peaks.

13. (Previously Presented) A method of claim 11, wherein the reference standard is a gas standard or a temperature-stabilized Fabry-Perot etalon.

14. (Previously Presented) A method of claim 12, wherein the reference standard is a gas standard or a temperature-stabilized Fabry-Perot etalon.

15. (Previously Presented) A method of claim 11, where frequency positions are measured.

16. (Previously Presented) A method of claim 11, wherein wavelength positions are measured.

17. (Previously Presented) A method of claim 11, wherein said Fabry-Perot etalon consists essentially of a solid sample of said substance having highly flat end surfaces.

18. (Previously Presented) A method of claim 11, wherein said Fabry-Perot etalon comprises an optical path consisting essentially of said substance and at the ends thereof highly flat plates of a different material.

19. (Currently Amended) A method of claim 11, wherein the change in length (ΔL) of said substance at two different temperatures is calculated from ~~the measured~~ differences ($\Delta \nu$) in the absolute position in frequency represented by multiple resonant interference peaks by the equation:

$$\Delta \nu = \frac{-\nu}{L} \Delta L , \qquad (4)$$

where L is the Fabry-Perot gap at the first temperature and ν is the frequency position of the

respective peak at said temperature.

20. (Previously Presented) A method of claim 11, wherein the frequency peak positions are in the range of 1300 - 1700 nm.

21. (Previously Presented) A method of claim 11, wherein the end surfaces of the etalon has $\lambda/20$ flatness or better and <0.5 arc second parallelism or better.

22. (Previously Presented) A method of claim 11, wherein the finesse of the etalon is 1 - 1000.